

## CLAIMS

What is claimed is:

- 1 1. A method of providing solutions to problems, the method comprising the steps of:  
2 generating problem definitions for problems;  
3 receiving environmental information required for generating solutions for  
4 the problems;  
5 generating solutions for the problems dependent upon the environmental  
6 information and the problem definitions;  
7 communicating solutions to clients before the solutions are needed.
- 1 2. The method of claim 1 wherein the problem definitions are for problems related  
2 to securities trading.
- 1 3. The method of claim 1 further comprising storing the problem definitions in  
2 problem definition records in a database.
- 1 4. The method of claim 1 further comprising storing the solutions in solutions  
2 records in the database.
- 1 5. The method of claim 4 wherein the solutions records have at least one relation to  
2 the problem definition records.
- 1 6. The method of claim 4 further comprising retrieving at least one solution from the  
2 solutions records in the database.
- 1 7. The method of claim 1 wherein at least one client is a broker-dealer computer  
2 system programmed and operated to effect securities trading.  
3







1 33. The method of claim 31 further comprising sending to at least one market at least  
2 one solution order, the solution order comprising the side, symbol, quantity, price,  
3 and market data elements from the found solution record.

1 34. A method of providing solutions for trading securities, the method comprising the  
2 steps of:

3 receiving a level-two quote, the level-two quote comprising a symbol and  
4 at least one market participant quote, the market participant quote  
5 further comprising a quote price, a quote quantity, a quote MPID,  
6 and a quote side;

7 creating in computer memory a solution set comprising at least one  
8 solution record corresponding to each market participant quote in  
9 the level-two quote, the solution record comprising a solution  
10 symbol, a solution side, a solution MPID, a solution price, a  
11 solution quantity, and a solution latency, the solution latency  
12 comprising a latency for the market identified by the solution  
13 MPID; and

14 sending the solution set to at least one client.

1 35. The method of claim 34, wherein the client comprises an automated system for  
2 trading securities, the method further comprising the steps of:

3 storing the sent solution set in computer memory in the client system;  
4 using at least one of the sent solution records to create orders for  
5 securities; and  
6 deleting from computer memory the used solution records.

1 36. The method of claim 35 wherein the client comprises more than one automated  
2 system for trading securities and the automated systems for trading securities are  
3 scaled.





5 means for generating solutions for the problems dependent upon the  
6 environmental information and the problem definitions;  
7 means for communicating solutions to clients before the solutions are  
8 needed.

1 53. The system of claim 52 wherein the problem definitions are for problems related  
2 to securities trading.

1 54. The system of claim 52 further comprising means for storing the problem  
2 definitions in problem definition records in a database.

1 55. The system of claim 52 further comprising means for storing the solutions in  
2 solutions records in the database.

1 56. The system of claim 55 wherein the solutions records have at least one relation to  
2 the problem records.

1 57. The system of claim 55 further comprising means for retrieving at least one  
2 solution from the solutions records in the database.

1 58. The system of claim 52 wherein at least one client is a broker-dealer computer  
2 system programmed and operated to effect securities trading.

1 59. The system of claim 52 wherein received environmental information changes, the  
2 system further comprising:

3 means for generating additional solutions dependent upon the changed  
4 environmental information and the problem definitions; and  
5 means for communicating additional solutions to clients before the  
6 additional solutions are needed.





1     70.     The system of claim 69 wherein the solution record is found, the system further  
2     comprising means for updating the solution record with the price from the quote.

1     71.     The system of claim 69 wherein the solution record is not found, the system  
2     further comprising means for creating a new solution record having the same  
3     problem type, side, and symbol as the problem definition record having the same  
4     side and symbol as the quote, the same market as the quote, and the same price as  
5     the quote.

1     72.     The system of claim 67, wherein a quote is received, wherein the quote tag  
2     indicates that the quote is closed, the system further comprising means for  
3     deleting solution records having the same side, symbol, and market as the quote.

1     73.     The system of claim 65 further comprising means for repeatedly finding a  
2     subscription record so that each existing subscription record is found in turn.

1     74.     The system of claim 73, wherein at least one subscription record is found, the  
2     system further comprising means for finding, for each found subscription record,  
3     a related record of data communications parameters for the client identified in the  
4     found subscription record.

1     75.     The system of claim 74 further comprising means for finding, for each found  
2     subscription record, at least one related problem definition record.

- 1 76. The system of claim 75, wherein at least one problem definition record is found,  
2 the system further comprising means for finding, for each found problem  
3 definition record, at least one related solution record.
- 1 77. The system of claim 76 further comprising means for communicating, dependent  
2 upon data communication parameters identified in the found record of data  
3 communications parameters, to the client identified in the found subscription  
4 record at least one data element of the found solution record.
- 1 78. The system of claim 52 wherein means for communicating solutions to clients  
2 comprises means for communicating solutions to an order processing system on a  
3 broker-dealer computer.
- 1 79. The system of claim 78 further comprising means for receiving at least one  
2 customer order.
- 1 80. The system of claim 79 wherein the customer order comprises data elements  
2 identifying symbol, quantity, and optionally, price, market, and order type.
- 1 81. The system of claim 80 wherein the customer order type has a relation to the  
2 problem type.
- 1 82. The system of claim 79 further comprising means for finding at least one solution  
2 record having the same symbol as the received customer order and also having a  
3 problem type related to the customer order type in the received customer order.
- 1 83. The system of claim 82 further comprising means for sending to at least one  
2 market at least one solution order, the solution order being dependent upon the  
3 customer order and the data in the solution record.



3 from the quote side, the solution MPID derived from the quote MPID, the  
4 solution price derived from the quote price, and the solution symbol derived from  
5 the symbol in the level-two quote.

1 89. The system of claim 85 wherein means for creating a solution set further  
2 comprises:  
3 means for calculating the solution quantity for the solution record  
4 dependent upon the quote quantity and dependent upon a hidden  
5 quantity ratio for the market identified by the solution MPID; and  
6 means for recording the solution quantity in the solution record.

1 90. The system of claim 89 wherein the hidden quantity ratio comprises a running  
2 average of the ratios of order fill quantity to quote quantity, the order fill quantity  
3 and the quote quantity being derived from trade data comprising descriptions of  
4 executions of orders for securities.

1 91. The system of claim 89 wherein the hidden quantity ratio comprises a decaying  
2 average of the ratios of order fill quantity to quote quantity, the order fill quantity  
3 and the quote quantity being derived from trade data comprising descriptions of  
4 executions of orders for securities.

1 92. The system of claim 89 wherein the hidden quantity ratio comprises a ratio of an  
2 order fill quantity to a quote quantity, the order fill quantity and the quote quantity  
3 being derived from trade data comprising descriptions of executions of orders for  
4 securities.

1 93. The system of claim 85, wherein the solution set comprises at least two solution  
2 records, the system further comprising means for sorting the solution records to  
3 yield sorted solution records.















side, a solution MPID, a solution price, a solution quantity, and a solution latency, the solution latency comprising a latency for the market identified by the solution MPID; and

send the solution set to a client; and

a memory coupled to the processor, the processor programmed to store the solution set in the memory.

138. The system of claim 137, wherein the client comprises an automated system for trading securities, the system further comprising a client processor coupled to client memory, the client processor programmed to:

- store the sent solution set in client memory;
- create, dependent upon the sent solution records, orders for securities; and
- send the orders for securities to markets.

139. The system of claim 137 wherein the client comprises more than one automated system for trading securities and the automated systems for trading securities are scaled.

140. The system of claim 137 wherein the processor is further programmed to record in the solution set the solution side derived from the quote side, the solution MPID derived from the quote MPID, the solution price derived from the quote price, and the solution symbol derived from the symbol in the level-two quote.

141. The system of claim 137 wherein the processor is further programmed to:  
calculate the solution quantity dependent upon the quote and dependent  
upon a hidden quantity ratio; and  
record the solution quantity in the solution record.

- 1 142. The system of claim 141 wherein the hidden quantity ratio comprises a running  
2 average of the ratios of order fill quantity to quote quantity, the order fill quantity  
3 and the quote quantity being derived from trade data comprising descriptions of  
4 executions of orders for securities.
- 1 143. The system of claim 141 wherein the hidden quantity ratio comprises a decaying  
2 average of the ratios of order fill quantity to quote quantity, the order fill quantity  
3 and the quote quantity being derived from trade data comprising descriptions of  
4 executions of orders for securities.
- 1 144. The system of claim 141 wherein the hidden quantity ratio comprises a ratio of an  
2 order fill quantity to a quote quantity, the order fill quantity and the quote quantity  
3 being derived from trade data comprising descriptions of executions of orders for  
4 securities.
- 1 145. The system of claim 137, wherein the solution set comprises at least two solution  
2 records, the processor being further programmed the solution records to yield a  
3 sorted solution set.
- 1 146. The system of claim 145 wherein the processor is further programmed to sort the  
2 solution records according to side.
- 1 147. The system of claim 145 wherein the processor is further programmed to sort the  
2 solution records according to price.
- 1 148. The system of claim 145 wherein the processor is further programmed to sort the  
2 solution records according to latency.
- 1 149. The system of claim 145 wherein the processor is further programmed to sort the  
2 solution records according to price and latency.

1 150. The system of claim 145 wherein the processor is further programmed to sort the  
2 solution records according to side, price, and latency.

1 151. The system of claim 145 wherein the processor is further programmed to delete  
2 solution latency from the sorted solution records.

1 152. The system of claim 137 wherein the processor is further programmed to create  
2 an index for the solution set.

1 153. The system of claim 137 wherein the solution record further comprises a type  
2 code.

1 154. The system of claim 137 wherein latency comprises the difference between the  
2 time when a broker-dealer receives from a market a response to an order and the  
3 time when the order was sent to the market.

1 155. A method of providing an improved level-two quote for trading securities, the  
2 method comprising the steps of:  
3 receiving in an automated system, which system comprises at least one  
4 computer processor coupled to computer memory, a level-two  
5 quote, the level-two quote comprising a data format further  
6 comprising a symbol and at least one market participant quote, the  
7 market participant quote further comprising a data format further  
8 comprising a quote price, a quote quantity, a quote MPID, and a  
9 quote side; and  
10 creating in computer memory, dependent upon the level-two quote, an  
11 improved level-two quote comprising a symbol and at least one  
12 improved market participant quote, which improved market  
13 participant quote comprises a side, an MPID, a price, a quantity  
14 dependent upon the market participant quote quantity and also

